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FORMULAS OF SITE INDEX PREDICTION TABLES FOR OAK IN MISSOURI

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ABSTRACT.--Recently published site index prediction tables for oak in Missouri were formulized using the "matchacurve" system. The average absolute differences between formula and table values were 0.8 feet for white oak and 1.4 feet for black and scarlet oaks; maximum differences were 3.0 and 4.2 feet, respectively.
OXFORD: 541:176.1(778) *Quercus* spp.
KEY WORDS: white oak, black oak, scarlet oak, matchacurve.

Expressing site index curves by formulas makes direct computation of site index from tree height/age data possible and eliminates the tedious and error prone process of reading and interpolating site index values from graphs. On large sets of data, this saves time and allows site index determinations to be integrated into computerized data processing systems.

Mathematical equations have recently been fitted to several previously published site index curves using complex exponential growth functions (Lundgren and Dolid 1970, Ek 1971, Payandeh 1974a and 1974b, Hann 1975). Wiant (1975) recently did the same for Schnur's (1937) site index curves for upland oaks using the "matchacurve" system (Jensen and Homeyer 1971, Jensen 1973).

This paper reports on formulation of site index prediction tables for black/scarlet oak (*Quercus velutina* Lam., *Q. coccinea* Muenchh.) and white oak (*Q. alba* L.) in Missouri (McQuilkin 1974). In the derivation of these tables, stem analyses data were used to develop (for the two species groups separately) seven linear regressions of the form:

$$\text{site index} = b_0 + b_1(\text{Height})_{\text{Age}}$$

for ages 10, 20, 30, 40, 60, 70, and 80. Site index was used as the dependent variable because the tables were designed to predict site index values for trees or stands of known heights and ages (Curtis *et al.* 1974). The results of these regressions plus interpolations between the equations were used to develop site index prediction tables at 2-year and 2-feet intervals.

FORMULATION PROCEDURE

For each species group the intercept and slope values of the seven $SI = b_0 + b_1(H)_A$ regressions were expressed as functions of age:

$$b_0 = f_0(A)$$

$$b_1 = f_1(A).$$

A straight line fit proved adequate for slope values for white oak, but slope values for black and scarlet oak and intercept values for both species groups followed curvilinear relations that were fitted using the "matchacurve" technique (table 1). These functions were then substituted into the original equation form to derive one equation for each species group which was applicable at all ages:

$$SI = f_0(A) + f_1(A)(H).$$

Prediction of the 582 table values for white oak and the 650 table values for black and scarlet oaks showed average absolute differences of 0.8 and 1.4 feet and maximum differences of 3.0 and 4.2 feet, respectively. Maximum differences between formula and table values exceeded 2.2 feet for white oak and 3.0 feet for black and scarlet oak only for predictions at age 80. Considering the inaccuracies inherent when height measurements are made in the field, the error in the formulated approach is relatively minor.

Table 1.--*Formulas for predicting intercept and slope values for site index regressions*

Species	Intercept (b_0)	r^2	Slope (b_1)	r^2
White oak	$0.000152(80-A)^{2.9}-0.179047$	0.98	$1.344432-0.007468A$	0.94
Black and scarlet oaks	$0.000058(80-A)^{3.2}-0.322803$	0.98	$0.99-0.225(A/80)^{4.8}$	0.95

Note: A = age in years (stump age or b.h. age plus 2 years). Formulas above are substituted back into the original equation: site index = $b_0 + b_1$ (height), for predictions.

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